

## CLAIMS

1. An interrogator which, together with a transponder, makes up a radio frequency identification system, comprising:

5 a transmitter/receiver circuit for generating a radio frequency transmitter signal;

a power amplifier for power amplifying the radio frequency transmitter signal;

10 an antenna for radiating the radio frequency transmitter signal outputted by the power amplifier;

wherein the transmitter/receiver circuit, the power amplifier and the antenna are provided for a portable wireless terminal;

15 a circuit for performing amplitude modulation on the radio frequency transmitter signal by information to be transmitted to a transponder; and

a mixer which outputs transponder data by performing synchronous detection, using a part of the radio frequency transmitter signal as a carrier, on a radio frequency receiver  
20 signal returned from the transponder and received by the antenna.

2. The interrogator according to claim 1, wherein the circuit for performing amplitude modulation is provided in an input stage of the power amplifier.

3. The interrogator according to claim 2, further  
25 comprising:

a coupler for extracting the part of the radio frequency

transmitter signal by coupling to the radio frequency  
transmitter signal outputted by the power amplifier; and

a circulator which, being positioned between the coupler  
and the antenna, extracts the radio frequency receiver signal  
5 outputted by the antenna discretely from the radio frequency  
transmitter signal being sent to the antenna and supplies the  
radio frequency receiver signal thus extracted to the mixer  
for performing synchronous detection.

4. The interrogator according to claim 3, wherein the  
10 circuit for performing amplitude modulation is an ASK (Amplitude  
Shift Keying) modulation circuit.

5. The interrogator according to claim 3, wherein the  
circuit for performing amplitude modulation is a gain control  
system in which a gain is controlled by a control signal, the  
15 control signal being information to be transmitted to the  
transponder.

6. The interrogator according to claim 4, wherein at least  
the ASK modulation circuit, the power amplifier, the coupler,  
the circulator and the mixer are arranged on one same circuit  
20 board.

7. The interrogator according to claim 4, wherein at least  
the ASK modulation circuit, the power amplifier, the coupler,  
the circulator and the mixer are arranged on one same IC  
substrate.

25 8. The interrogator according to claim 5, wherein at least  
the coupler, the circulator and the mixer are arranged on one

same circuit board.

9. The interrogator according to claim 5, wherein at least the coupler, the circulator and the mixer are arranged on one same IC substrate.

5        10. An interrogator which, together with a transponder, makes up a radio frequency identification system, comprising:

        a first antenna, provided for a portable wireless terminal, for radiating radio waves of a first radio frequency transmitter signal;

10        a second antenna for receiving the radio waves radiated from the first antenna and outputting the first radio frequency transmitter signal;

        a divider for dividing the first radio frequency transmitter signal outputted by the second antenna;

15        a rectifier for rectifying one of the first radio frequency transmitter signals outputted by the divider and outputting a power supply;

        an ASK (Amplitude Shift Keying) modulation circuit for performing amplitude modulation on the other of the first radio  
20 frequency transmitter signals outputted by the divider by information to be transmitted to the transponder and outputting the amplitude-modulated signal as a second radio frequency transmitter signal;

        a third antenna for radiating the second radio frequency  
25 transmitter signal outputted by the ASK modulation circuit;  
and

a mixer for performing synchronous detection on a radio frequency receiver signal returned from the transponder and received by the third antenna by using part of the second radio frequency transmitter signal as a carrier and outputting  
5 transponder data.

11. The interrogator according to claim 10, further comprising:

a coupler for extracting the part of the second radio frequency transmitter signal by coupling to the second radio  
10 frequency transmitter signal outputted by the ASK modulation circuit; and

a circulator which, being positioned between the coupler and the third antenna, extracts the radio frequency receiver signal outputted by the third antenna discretely from the second  
15 radio frequency transmitter signal being sent to the third antenna and supplies the radio frequency receiver signal thus extracted to the mixer for performing synchronous detection.

12. The interrogator according to claim 11, wherein at least the second antenna, the third antenna, the divider, the  
20 rectifier, the ASK modulation circuit, the mixer, the coupler and the circulator are formed in a unitary structure.

13. The interrogator according to claim 11, wherein the information to be transmitted to the transponder and the transponder data outputted by the mixer are supplied to the  
25 portable wireless terminal as data to be processed by the portable wireless terminal.

14. The interrogator according to claim 10, wherein the second antenna has a cylindrical structure with a built-in antenna coil and an internal diameter of the second antenna is such that the first antenna is insertable in the second antenna to come into close contact with the second antenna.

15. An interrogator which, together with a transponder, makes up a radio frequency identification system, comprising:

a first antenna provided for a portable wireless terminal for radiating radio waves of a first radio frequency transmitter signal;

a second antenna for receiving the radio waves radiated from the first antenna and outputting the first radio frequency transmitter signal;

a rectifier for rectifying the first radio frequency transmitter signal outputted by the second antenna and outputting a power supply;

an oscillator circuit for generating a signal of a particular frequency;

an ASK (Amplitude Shift Keying) modulation circuit for performing amplitude modulation on the signal of the particular frequency outputted by the oscillator circuit by information to be transmitted to the transponder and outputting the amplitude-modulated signal as a second radio frequency transmitter signal;

a third antenna for radiating the second radio frequency transmitter signal outputted by the ASK modulation circuit;

and

a mixer for performing synchronous detection on a radio frequency receiver signal returned from the transponder and received by the third antenna by using part of the second radio frequency transmitter signal as a carrier and outputting  
5 transponder data.

16. The interrogator according to claim 15, further comprising:

a coupler for extracting the part of the second radio frequency transmitter signal by coupling to the second radio frequency transmitter signal outputted by the ASK modulation circuit; and  
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a circulator which, being positioned between the coupler and the third antenna, extracts the radio frequency receiver signal outputted by the third antenna discretely from the second radio frequency transmitter signal being sent to the third antenna and supplies the radio frequency receiver signal thus extracted to the mixer for performing synchronous detection.  
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17. The interrogator according to claim 16, wherein at least the second antenna, the third antenna, the rectifier, the oscillator circuit, the ASK modulation circuit, the mixer, the coupler and the circulator are formed in a unitary structure.  
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18. The interrogator according to claim 16, wherein the information to be transmitted to the transponder and the transponder data outputted by the mixer are supplied to the portable wireless terminal as data to be processed by the portable  
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wireless terminal.

19. The interrogator according to claim 15, wherein the particular frequency of the signal is approximately equal to or higher than the frequency of the first radio frequency  
5 transmitter signal of the portable wireless terminal.

20. The interrogator according to claim 15, wherein the second antenna has a cylindrical structure with a built-in antenna coil and an internal diameter of the second antenna is such that the first antenna is insertable in the second antenna  
10 to come into close contact with the second antenna.